MICHIGAN ENVIRONMENTAL SCIENCE BOARD
MEETING SUMMARY
TUESDAY, DECEMBER 14, 1992
ROOM A271, PLANT AND SOIL SCIENCE BUILDING
MICHIGAN STATE UNIVERSITY
EAST LANSING, MICHIGAN

I. CALL TO ORDER

Dr. Lawrence Fischer, Chair, called the meeting of the Michigan Environmental Science Board Mercury Panel to order at 1:15 p.m. Dr. Fischer stated that following the scheduled presentations, he would like the Panel to focus their discussion on the mercury contamination questions posed by the Governor. It was hoped that by the end of the meeting, each Panel member would be assigned to draft or assist in the drafting of a response to each of the Governor's questions.

II. EXECUTIVE DIRECTOR'S REPORT

Mr. Harrison indicated that each Panel member had been provided several handouts. The first was an expense form that they would need to fill out and return as soon as possible after the meeting. The second (Attachment 1) was a paper from Mr. Terry Clark, USEPA, who could not make the meeting due to illness. The third (Attachment 2) was a correspondence from Dr. Kay Jones, Zephyr Consulting, containing a review of the DNR's June 1991 impact analysis of the proposed Oakland County Waste-To-Energy facility . Mr. Harrison briefly discussed state procedures which must be used by the Board in order to acquire the assistance of outside experts and consultants on matters which may come before the Board Panels. The procedures will be sent to each member for future reference. Finally, Mr. Harrison reminded the Panel members of an earlier request from him for possible suggestions on environmental protection/natural resources management issues which might be transmitted to the Governor's office.

III. PRESENTATION: UPDATE ON MERCURY RESEARCH PROGRAMS

Dr. Don Porcella, of the Electric Power Research Institute (EPRI), made the following presentation:

A major development in mercury science came about with the discovery that mercury in the atmosphere was a major contributor to mercury in fish. Moreover, in the past it had been assumed that emissions translated directly into depositions. That assumption was unwarranted. The kinetics of transport, wet and dry deposition, and scavenging are not well understood. There is not a good understanding of the form of mercury that comes out of different sources. New research indicates that power plants are emitting both mercury-two and mercury-zero, not just mercury-zero, as had been previously thought.

In order to understand some of these processes, EPRI has initiated a series of research projects:

1) Emissions

Speciation (RP3177-03)
Mass Balance (RP3177-03)
Methods Intercalibration (DOE)
Historical Emissions Data (RP2933)

2) Atmospheric Transport/Transformation

Process and Reaction Rate (RP3218-01) (Nick Bloom)
Dry Deposition (RP3218-02) (Steve Lindberg, Oakridge)
Florida Atmospheric Mercury Study (FAMS) (RP3297-01)

3) Ecological Cycling/Fish Accumulation

Methods Development (RP2020-03-04)
Fish and Water Quality (RP2020-05)
Reservoir and Point Sources (RP2020-09)
Mercury in Temperate Lakes (MTL) (RP2020-10)
Historical Deposition (Peat Cores) (RP2020-12)
Mercury Accumulation Pathways and Processes (MAPP)(RP3297-02)
Methods Intercalibration (3297-02)

4) Risk Assessment and Human Health

Comprehensive Risk Evaluation (CORE) (RP3081)
Risk - PISCES (RP3081)
Human Health Assessment (RP2310)

At the beginning of the emissions projects, EPRI was not able to speciate or come close to a mass balance. Now they have developed techniques that will give good speciation and are doing some work with the National Institute of Standards and Technology to verify the measurements. They are getting close to 80-90% on mass balances. The dry deposition work is beginning to show that absorption of mercury-zero by foliage is probably not a significant part of the mercury cycle, a finding that contradicts Swedish work. The Florida study will measure mercury components in the air and in wet depositions at five stations for four years.

Dr. Wolff expressed concern that the mercury-two that is in the gas phase in the stack will be in the particulate phase when it comes out, and that this transformation will be missed if only stack measurements are taken. Dr. Porcella responded that EPRI is convinced that there are transformations taking place very rapidly as emissions move through the power plant train, but there are not good data on those transformations. EPRI plans to do some plume measurement work, but part of the work is waiting for the

development of techniques that are sensitive enough to measure the low concentrations. It wasn't until 1989 that ambient concentrations of different species of mercury could be measured. A project is underway to develop new techniques for measuring methylation. There is also a large methods intercalibration for aquatic systems study underway, and one planned for atmospheric systems. Human health risk assessment projects are being undertaken and are associated with the USEPA's efforts to come up with a risk assessment as part of the Clean Air Act Amendments.

Dr. Fischer asked about the progress of the human health studies. Dr. Porcella responded that those projects are in the early development stages, and that part of the work will be to analyze the data collected in the Seychelles.

Dr. Porcella discussed the global estimates of mercury. Globally, the total mass of mercury in the atmosphere is estimated to be 6,000 tons, and with a one year residence time in the atmosphere, that means about 6,000 tons of mercury cycling through the atmosphere every year. Marine sources produce about 2,000 tons a year. The best current estimate is that about two-thirds of the total may be from past anthropogenic inputs, although the timing of those inputs is uncertain. Anthropogenic inputs have been estimated at 2,000 to 3,000 tons a year. Not all the mercury released goes into the atmosphere and becomes part of the global cycle. Terrestrial mercury is the poorest understood, and is estimated more by difference than accurate measurement. Assuming that the anthropogenic input is 3,000 tons a year, the best estimates are that coal combustion on a global basis, waste incineration, and other anthropogenic sources each contribute about a third, with coal burning electric utilities producing about 80 tons a year.

Dr. Fischer asked how the terrestrial number was obtained. Dr. Porcella responded that the older estimates of mercury evasion from land surfaces are grossly overstated, and volcanic outputs, which have been suggested as mercury sources, vary widely. EPRI thinks those numbers are so much in error that they can't be used. They have estimated terrestrial input by subtracting the sum of anthropogenic and oceanic from the total, assuming a one year residence time and a steady state system. That result has been compared with good land evasion numbers and falls within the expected range. However, he doesn't feel comfortable with the estimates yet. There are more good data on oceans than on any other source.

He further indicated that one of the key developments in mercury analysis was the development of clean measurement techniques. Measured mercury from a Wisconsin lake went from nearly 250 ng/l in 1983 to 1 ng/l in 1986 as a result of clean techniques. This number makes sense in terms of rate processes and is reproducible under a wide variety of conditions. As a result of the clean techniques there is now a good idea of what typical mercury concentrations, should be in air and water, and using these numbers as a rule of thumb, contaminated samples can be identified.
Remote air samples generally show 1 to 2 ng/m3, 2 ng/m3 in the northern hemisphere and 1 ng/m3 in the southern, indicating additional anthropogenic sources in the north. In water, 1 ng/l in remote samples, to 5 ng/l, are common. The highest concentration

found was 6 ng/l, even with a high level of contamination. Open ocean levels are 1 to 2 ng/l . There are a number of good measurements for both remote and contaminated biota and sediments, ranging from .05 - 3 mg/kg in remote sites to .05-10 mg/kg in contaminated sites.

Dr. Porcella presented the EPRI model, describing the mass balance of Little Rock Lake in Wisconsin. One observation was that, according to this model, methyl mercury is not deposited, but is formed in the lake. If the methylation process were understood, we would begin to understand the mercury problem. He went on to discuss Swain's work, suggesting that modern deposition is about 3.7 times pre-industrial deposition, and Fitzgerald's work on peat cores, which showed a similar ratio. Neither set of measurements suggests much variation within the modern period. For the EPRI model seven Wisconsin lakes were studied. One year old whole yellow perch were analyzed. If all the mercury contamination comes from the atmosphere, with uniform deposition it would be expected that all would have the same mercury content. However, there was variation among the lakes and fish, by a magnitude of 10. Water chemistry in local lakes seems to be responsible, with high pH enhancing formation of methyl mercury as a co-product of sulfate-reducing bacteria.

Dr. Premo noted that the model was consistent with Dr. Carl Watress's observation that most of the methylation takes place during the anoxic hypolimnion in the summer and not in the winter. This supports the theory that methylation is a bacteria controlled process, because the cold winter temperatures decrease bacterial activity and decease methylation even in an anoxic hypolimnion. Dr. Porcella responded that the biotic methylation may be a particular factor in methylation in some cases, for instance wetlands. Or the process may be controlled by the amount of mercury-two available to be methylated.

Dr. Fischer asked whether the Wisconsin data presented by Dr. Porcella supported the feeling in Michigan that fish levels of mercury are increasing over time. Dr. Porcella answered that he hasn't seen any data that show an increase. There are no long term databases. Florida researchers say the concentration in Florida today is no worse that it was 10 years ago.

Dr. Fischer asked if Dr. Porcella had any comments on studies comparing mercury levels currently found with levels in museum specimens. Dr. Porcella answered that Bill Fitzgerald says that mercury had been used in preservatives, so the specimens may be contaminated. On the other hand, since mercury is unstable, it may be lost. No one knows.

Dr. Premo asked how Dr. Porcella would test the EPRI model under budget constraints. What indicator would be most important? Dr. Porcella answered that he would look at fish tissue levels first, then water concentrations of mercury-two.

Dr. Wolff asked whether anything is known about seasonal variations of mercury in precipitation, particularly rain vs. snow. Dr. Porcella thinks all precipitation is similar.

Dr. Long asked what was known about human risk. Dr. Porcella replied that some work has been done, but that there are not many measures of blood mercury in humans. He thinks the risk is the same as it was 20-30 years ago. The important questions have to do with the levels and risks for children and fetuses. There is still a lot unknown.

Mr. Sills, DNR, noted that regulatory agencies set water quality standards based on single values of total mercury in unfiltered samples, and asked Dr. Porcella's opinion on the adequacy of that approach, given the intricacies of the model presented. Dr. Porcella responded that sometimes the EPRI model yielded results similar to those obtained by current regulatory measurement methods, but generally he didn't think such methods, which measure bioaccumulation, are defensible ways of determining safe limits. The actual amount of exposure can be over or underestimated. The EPRI model is now being tested in a variety of environments, and results should be available in about six months. He expects it to do well and to be useful in regulation.

Mr. Hahn, Ogden-Martin Systems, asked whether EPRI had modeled the effects of a decrease in acid rain on sulfate stimulation of mercury methylation. Dr. Porcella responded that no such analysis had been done, although there is related work being done by Gilmore at Harvard.

Mr. Hahn asked whether EPRI had done any research on actual patterns of fish consumption, noting that most figures currently used are averages and special cases. Dr. Porcella answered that EPRI hasn't done that, but is evaluating data on chronic long-term exposure in the Seychelles.

Dr. Wolff mentioned that a recent paper by Slemmer and Langer concluded that mercury concentration is rising, based on remote measures over the Atlantic. Dr. Porcella commented that, although the research is good, he mistrusted the two point curve, and did not have strong feelings one way or another about whether it represented a true trend. An alternative explanation may be the widespread use of mercury in the Amazon River Basin.

Dr. Demers asked whether there was any evidence of downward trends, and whether Dr. Porcella could provide the Panel with any references. Dr. Porcella cited the peat core data, which are due out next summer and said he would try to get something for the Panel.

Dr. Fischer questioned why trend analyses do not show easily measurable increases in fish and the environment when there has been such a large increase in waste incineration and coal-burning power plants. Dr. Cook stated that it might be because emissions were not actually measured, but were estimated based on mercury content of coal. Dr. Porcella said that EPRI is now looking at actual, rather than assumed, coal content, and finds that prior estimates may have been high. He said that if coal fired plants in the U.S. were eliminated, the amount of global mercury would be reduced by only about 1.25%.

Dr. Bulkley asked whether loadings to the several Wisconsin lakes EPRI tested, where mercury accumulation in fish varied by a factor of 10, were essentially the same. Dr. Porcella responded that atmospheric deposition was assumed to be uniform, but that the loading for each lake was different depending on the size of the lake and other characteristics. The difference in mercury uptake in fish must be explained by factors affecting the methylation processes, and by processes of accumulation in the food chain.

Dr. Long commented that it is possible that fish may not, in fact, show the results of increased loading over time, since processes removing mercury from the waste column are probably fast, and fish may never be exposed to the increase. He stated that an additional gap in the mercury cycling research concerns terrestrial processing.

IV. REVIEW OF DATA RELEVANT TO GOVERNOR'S QUESTIONS

Dr. Fischer presented the below listed conclusions regarding methyl mercury exposure relative to human health. The conclusions were prepared in conjunction with Dr. Demers. References for the studies mentioned in conclusions are attached to the minutes (Attachment 3).

1. There is adequate evidence to indicate that fetal exposure to methyl mercury represents the situation of highest risk for causing deleterious effects in the human population. This conclusion results from observations made in severe poisonings in Iraq and Japan and is supported by results from laboratory animal studies.

2. The data presented by Marsh et al. (1) from studies of exposed mothers and their offspring in Iraq produces a dose response relationship from which a threshold level for the adverse effects of methyl mercury exposure can be estimated.

3. Examination of the actual values for effects in children that were reported by Marsh et al. (1) indicate that adverse effects become obvious at values over 100 ppm and are less obvious between 40 and 70 ppm of mercury in maternal hair. No convincing evidence is found in the data for effects of methyl mercury when hair levels are below 20 ppm in hair.

4. The mathematical analysis of the Iraq data by Cox (2) attempts to determine the shape of the methyl mercury exposure-response curve. Using curve smoothing techniques, the procedure indicated a threshold for effects observed in children was in the range of 10-20 ppm of total mercury in maternal hair. This threshold has considerable uncertainty because there was only 1 abnormal value for a reliable indicator (retarded walking) among the 8 children tested in this exposure range.

5. Data provided from epidemiological studies in offspring of fish eaters populations in Quebec (3) do not indicate that abnormalitities can be detected in children when

maternal hair levels are below 12 ppm. A statistically significant reduction in deep tendon reflexes was observed in boys, but not in girls, who were at the highest exposure level (13-24 ppm in maternal hair). The clinical significance of this finding was questioned by the authors.

6. Data from a study conducted in New Zealand children (4) were not considered helpful in assessing possible health risks from methyl mercury exposure. This was because the study had serious deficiencies in population selection and in the use of measurements for intellectual development.

7. The World Health Organization (WHO) has adopted the range of 10-20 ppm of total mercury in maternal hair as a threshold for methyl mercury effects (5). This threshold range is supportable using the approach by Cox (2) and adopting a reasonably conservative approach. Below 10 ppm in hair there seems no cause for a health concern. Background levels in hair are in the range of 0.5-2 ppm. Hair values between 10 and 20 ppm do not appear to represent a public health problem but should be considered a range in which precautions should be taken to limit exposure. Measurable adverse effects may occur somewhere between 20 and 100 ppm but more data similar to those presented by Marsh et al. (1) are required to narrow the threshold range. Values over 100 ppm in hair are likely to produce adverse effects in adults and children. Therefore, 100 ppm in hair might be considered a Lowest Observable Adverse Effect Level (LOAEL). Applying a safety factor of 10 to the LOAEL would produce an estimated No Observable Effect Levek (NOEL) of 10 ppm in hair. This supports the selection of 10-20 ppm in hair as a level at which exposure reduction actions should begin.

8. Summary

Exposure Measure (ppm in hair)	Health Concern
0-10	None at present
11-20	No effects likely, precautions taken
21-100	Exposure restrictions needed
100+	Exposure reduction needed, treatment considered

9. The quantitative aspects of exposure to methyl mercury in Michigan residents are not known. The only data available are from a study by DPH using fish eating adults from Algonac and Grand Haven, Michigan in 1974 (6). Those studies indicated that persons eating fish from Lake St. Clair at the highest rate (70+ lbs/yr, about 3 meals per week) had mean blood levels of total mercury of 77.7 ppb (maximum 95 ppb) and this is equivalent to a hair level of 19 ppm. No other exposure group from either site had blood levels that were in the range suggested for initiating exposure reduction; i.e., equivalent

to 10-20 ppm in hair. The average total mercury levels in fish from Lake St. Clair was reported to be 1.25 ppm with walleye as high as 12.0 ppm. The average levels from fish caught in the southern half of Lake Michigan was 0.2 ppm. More current data are needed to determine if mercury levels are increasing in Michigan residents, particularly those having fish consumption.

Dr. Fischer summarized his presentation by indicating that mercury appears to be a little more troublesome than he had thought it to be. If the threshold is really in the 10 to 20 ppm range, and fish eaters can get close to 20 ppm, then we don't have a large safety margin. He stressed that it is important that we know at this time whether mercury levels are going up or not in the human population, in wildlife, including fish. We need to know the trends. If they are going up, something definitely will need to be done. If they are stable or decreasing, that may be another matter. If the trend cannot be determine, then a big hole exists in the database.

Dr. Premo asked the source of methyl mercury in the Iraqi study. Dr. Fischer answered that the source was seed grain treated with methyl mercury as a fungicide. Instead of planting the seeds, they ground them up and made them into flour, and then ate the bread. This resulted in massive poisoning.

Dr. Long asked when and from whom were the hair samples taken in the Iraqi study. Dr. Fischer stated that the hair was taken when the child was born, thereby providing a record of exposure during pregnancy. The hair was analyzed segmentally and the maximum reported instead of the average level that was found.

Mr. Jeff Hahn, Ogden Martin, stated that at the Monterey Conference an individual from the Free Indian Nation talked about the findings of the Quebec study. He questioned if other factors, such as increased ingestion of cholesterol and alcohol, could have confounded the results, since there was also documented a dramatic change in the health of the Indians in the area over the time that the mercury increased. Dr. Fischer responded that they looked at smoking and alcohol consumption and there was no correlation between health effects and smoking or alcohol consumption. They didn't look at any other dietary factors. The hair record provided evidence oflevels of mercury in the women. The Quebec study is not conclusive in terms of mercury causing changes in neurological status.

Dr. Premo asked whether the kinds of fish that were tested for mercury in the Algonac and Grand Haven studies were the same kind of fish that the people were eating. John Hesse (DPH) stated that they have data on each individual participant in the records. It hasn't been analyzed yet, but it should be available. The questionnaire did ask the specific species that they ate the most of, sohe thought that it could be determined from a review of the original questionnaire. Dr. Fischer asked Mr. Hesse to provide that data to Mr. Harrison, so that it can be distributed to the Panel.

Dr. Premo stated that the kind of fish that people like to eat is really critical to the answer since there seems to be a wide variety. The levels of mercury are going to be

fairly high in a case like this and if you're averaging that with blue gills for instance, it's really going to drown out the average.

Dr. Fischer stated that in light of some of the missing information, the Panel need to be careful when looking at these kinds of data.

Mr. Hesse indicated that the upper end of the range was an individual claiming to eat 125 pounds a year and that person's blood level was 95.6 ppm. The fish eaters group ranged from anywhere from 3 to 95.6 ppm.

Mr. Hahn asked if the reported consumption amounts included store bought fish or was it all sport-caught fish. Mr. Hesse answered that the questionnaire did try to separate out that kind of data. He believed that the reported amount included sport-caught fish.

Dr. van Ravenswaay asked if any other foods were asked about in the Michigan study, since mercury was a problem in pheasants at that time. Mr. Hesse answered that they did collect some information on other foods, however, he did not think that they got into other wildlife consumption. Mr. Hesse questioned whether a problem with mercury levels in pheasants or other seed-eating birds in Michigan had, in fact, been documented. He acknowledged that it was a problem in Sweden where mercuric fungicides had been heavily used on agricultural seeds.

Dr. Cook indicated that the Agency for Toxic Substances and Disease Registry (ATSDR) has recommended a lowering of the recommended maximum daily intake, and he thought that New Jersey was considering the same thing. He asked Dr. Fischer if he had looked at those sets of recommendations to see the reasons for evidently concluding that mercury is more problematic than had been considered in recent years. Dr. Fischer answered that he had not. This was something that the Panel needs to do. He also would like to see the mercury report from New Jersey to see what they were doing.

Mr. Hahn indicated that he had a copy of the New Jersey report and they used the Marsh and Cox data. He was concerned with the data that the ATSDR used. Apparently, the ATSDR used data from one-time feeding studies on animals. He further indicated that he was impressed to see Dr. Fischer's treatment of the data, because never in his task force meetings in New Jersey did he see the data presented in the same manner. He stated that New Jersey went along with the same Marsh data, but applied higher safety factors.

Dr. Fischer stated that Bob Sills has communicated with Tom Clarkson in Rochester about what the human health threshold might be and Dr. Clarkson felt it wasn't right to apply the safety factor approach to these data. He felt that the best way to get at it was to look at the Iraqi data and try to pick the threshold from looking at all the data. Dr. Fischer indicated that this was a difficult process at best. In addition, he stated that the WHO appeared to be heavily influenced by Cox's analysis. He has written some people about the curve-smoothing analysis Cox used. He stated that there was uncertainty in

picking the range of 10 to 20 ppm. The uncertainty is great in using the curve-smoothing analysis because of the small number of children represented in the threshold range. There were only 8 children in the 10-20 ppm range, and 2 were in the abnormal range; 1 was slightly above and the other was way above. The latter looked like an aberration in the data. While the mathematical treatment is nice, there's not a lot of data to allow much certainty that this represents the true threshold for methymercury effects.

Bob Sills (DNR) stated that he had been staying in touch with the USEPA and had looked at the risk assessment part of the New Jersey report and it seems that everybody is coming to a common conclusion that about 10 ppm in hair is the lowest end of the low range and everybody seems to be in agreement that we'll use this conversion factor to equate that to a daily oral dose. The 10 ppm in hair would be associated with an oral dose of .6 ug/kg per day. What he thinks will make a major difference, though, in regulatory programs, is what is done with that starting point, thebench mark. The USEPA is considering, and what New Jersey seems to have done in their report, is to apply a factor of about 10 onto the low range, which results in a hair level of about 1 ppm, which is a background level in non-fish eaters and an oral dose of about .06 ug/kg per day. That is 5 times lower than the current USEPA reference dose in the Iraq database. The major point of contention is what do with the threshold. It is very important to characterize the levels because there is a big difference saying someone is at risk and saying they are at a level that we think is not ideal. That is what Dr. Fischer was alluding to, that the threshold of 10 ppm is not a risk level. The DNR would like to see it lower than that, but it doesn't mean that anything above that is going to result in a toxic effect.

Dr. Fischer asked Mr. Hesse, if .6 ug/kg is equivalent to 10 ppm in hair, what is the value for consumption that drives the Michigan Fish Advisories?

Mr. Hesse stated that it is based on the WHO's lowest observed effect level in the Japanese poisoning of 200 ppb in blood and through their calculations of what ingestion rate was equivalent to about 200 ppb in blood. They came up with 300 ug per day for a 70 kg person, which equates to .4 ug/kg/day.

They started out from the 200 ppb lowest observed effect in adults, which is about equivalent to 4 mg/kg/day. In order to maintain a safety factor for the protection of adults, they multiplied the factor by .1, which brought the value down to 20 ppb in the blood or approximately .4ug/kg. This was the basis of the 30 ug per day methyl mercury allowable daily intake. A person can eat about 1/2 pound of fish per week contaminated at 1.0ppm (the mid-point of t he DPH restricted consumption range of 0.5-1.5 ppm). Then, in order to protect the fetus, which some of the more current studies show may be 4 times (range 2-6) more sensitive than the adult, the .4 ug/kg body weight was cut by 4 and recommendations were made for women of childbearing age to eat 1/4 less fish than the general population; which is one meal per month. If you figure out how much your exposure is at .5 ppm, which was the trigger value used to start with, you can eat about a pound of fish a week and stay within the 30 ug/kg per day or a

half pound at 1 ppm or a quarter pound at 1.5 ppm. Michigan's generic advisory which applies to all inland lakes, assumes the midpoint of this range resulting with the one meal a week value for the general population. Mr. Hesse showed that a more complicated advisory approach could have been used recognizing the clear relationship between the level of mercury in fish tissue and the number of meals for the adult. One could eat 40 meals a month at .1 ppm, but only 2 meals a month at 2 ppm and for women of childbearing age, no more than one meal a month at 1 ppm, which is consistent with advisory, nor more than 10 at 0.2 ppm which is considered to approximate general background levels in fish. Mr. Hesse indicated that the formula that was used to project what intake rate would maintain a safe level in the blood of no more than 20 ppb also took into account losses as well as continued input. The generic advisory puts some size limits on the smaller piscivorous fish like crappie, perch and rock bass, at 9 inches. In order to come up with this size, specific information on individual species were pooled and a scattergram was prepared for about 62 lakes. The scattergrams were evaluated to see where a high percentage of the fish start going over .5 ppm. For walleye they start going over at about 18 inches. Walleye are legal for harvest depending on the water body at 15 inches. Since there were only a couple of inches span in terms of the legal size limit to the size that they were going over .5 ppm, all legal sizes were included. Northern pike began exceeding the 0.5 ppm trigger value at about 22 inches; large mouth bass at 14 inches.

Dr. Fischer asked if Mr. Hesse had developed any trend analysis for inland lake fish. Mr. Hesse answered that the DNR has set up a trend monitoring program just in the last few years and are starting to collect those kind of data in a controlled fashion. They have only two data points, however, for most water bodies. In some bodies of water there appears to be a statistical increase based upon those two data points, while in others, it's the other way. So he didn't have a lot of confidence in those data yet. As a consequence, data are not available to conduct a trend analysis for inland fish.

Ms. Tracey Easthope (Ecology Center) asked if the Japanese data had a control group and also if it looked at more sensitive subclinical measures like reaction to stress or attention span. Dr. Demers answered that there were no control groups or sensitive measures used in any of the studies, including those conducted in Iraq and New Zealand and with the Cree Indians.

Dr. Fischer commented that it's a real problem determining whether the results from a particular test, even if it is very sensitive, has any real clinical meaning, because if you are looking for the lowest level you can measure any biological effect, then you must start thinking about whether that biological effect really represents an adverse effect, a public health problem on the way. It is often easy to make very sensitive measurements but to interpret them in terms of public health threats is the real problem.

Dr. Demers commented that he wanted to go on record just to identify the weaknesses in the studies. There are six weaknesses. First, the sampling was based on convenience in all cases. It was conducted on who they could get. Second, the outcomes were for the most part not standardized and that includes the type of testing.

Third, there was a cultural bias that was substantial in each of the cases. Fourth, there was no control group for any of these studies. Fifth, the numbers were small, and sixth, there were no long-term follow-up studies conducted.

Dr. Bulkley commented that it was important for the Panel to give careful consideration as to what kind of an advisory the state might want to come out with. Until we know more, he would rather weigh in on the conservative side, by advising women and maybe any person under 50, to not eat the fish for a while until we know more. He was more comfortable with that than all this business with the scatterplot and it's 9 inches and things, since there were some relatively short fish shown in Mr. Hesse's chart that had high levels of mercury.

Dr. Demers stated that he agreed with Dr. Bulkley, but going with the WHO guidelines should protect the Panel's decision to some degree. The real issue before the Panel, however, is whether it recommends that it be taken down to background levels, which is a much heavier decision.

Dr. Fischer indicated that the other part of the Governor's first question was to compile existing data regarding levels of mercury found in emissions in the environment. He felt that the Panel has that data, however, it still needs to translate those levels in the environment to a risk to the environment and, of course, a risk to human health. He stated that we need to know whether the levels are high enough to be a concern, risk-wise, to the environment and human health. We have already discovered that we cannot make any determination from fish and sediments data to ascertain whether mercury exposure is going up.

Dr. Long indicated that, in terms of sediments, data will be available in about two months which will potentially address that question for lakes surrounding Michigan. In addition, some data are available from a student for Lake Ontario and Northern Lake Michigan and we have a little data from Superior which show the trends increasing with recent times in general. In addition, the data that Red Evans compiled is available. The only problem with Red Evan's data is that, although he did a good job of collecting it, he had no control on where he took the s amples in the lakes, meaning that to get the accurate record you have to have a depositional area of the lake and not have any erosion occurring. Given the number of lakes that he sampled, his data may still be meaningful, however, if taken as a whole. If all the lakes show the same pattern, then you might be able to reach a meaningful interpretation of what is taking place.

Mr. Leonard commented that the correlation of fish and sediment data is not necessarily linear. Lake Erie, for instance, has the highest mercury levels in the water column and the Army Corps of Engineers' data show that the sediment level of mercury has been increasing, yet Lake Erie has some of the lowest mercury levels in fish, probably because it is more productive as a result of all the nutrients going into it. So while it may be good to look at sediment trends, he felt that it would be even better to take the available data that the DNR and the DPH have on fish levels, and to at least calculate what the average levels are in fish in lakes from the data.

Mr. Hesse handed out DNR's most recent compiliation of mercury concentration data obtained from inland lake fish since 1991 (Attachment 4).

Dr. Premo asked if it would be possible for the Panel to get the range of mercury values which were used to determine the average mercury concentrations. Mr. Hesse indicated that he would provide it to Mr. Harrison.

Dr. Fischer asked that each Panel member look at the Governor's questions and to address them based upon their area of expertise and understanding at this point in time. Each Panel member should come in next time with something said about each one of the points that they can say something about. He also encouraged each memb er to send questions and comments among themselves before the next meeting so that the Panel can begin to have some interaction before it meets next time.

Dr. Fischer asked Dr. Premo to write up the data on eagles compiled by Red Evans. He also asked Dr. Wolff and Dr. Premo to write the response on the sources of mercury in air and water, respectively.

Dr. van Ravenswaay commented that she had been doing some research for alternatives for controlling mercury emissions. Dr. Fischer asked that she share her information with Dr. Cook.

Dr. Bulkley indicated that he would work on question three.

V. NEXT MEETING DATE

The next meeting date will be Tuesday, January 26, 1993. The location will most likely be at Michigan State University. The Executive Director will inform the Panel members of the meeting location once it is finalized.

VI. PUBLIC COMMENT

Joy Taylor, DNR, presented clarification regarding the DNR document entitled, "Michigan's Environment with Respect to Mercury", which was attached to the Panel's September 11, 1992 minutes. The in-house document specifically related to the proposed Oakland County Waste- to-Energy permit and was not prepared to either support of find fault with draft Senate Bill No. 795.

Marian Stroup, Romeo, Michigan, presented information from the International Joint Commission on the global nature of persistent toxic substances problems and the need to achieve their virtual elimination.

Lorraine Kulhanek, Citizens Environmental Advisory Committee, Saginaw, Michigan, informed the Panel about a program being instituted by the Catholic Church to foster stewardship of the earth.

The meeting was adjourned at 5:00 p.m.

Keith G. Harrison, M.A., R.S., Cert. Ecol.
Executive Director